Effective Teaching and Learning in Digital Education for Czech Students with Diverse Needs

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The authors describe different aspects of using information and communication technologies to promote effective teaching and learning for students with diverse needs in inclusive schools. The review of current research in each described area follows the theoretical concepts, as well as the description of hardware, software and other special aids that can be used at schools. A wide range of digital tools, suitable for children with special educational needs and thus diverse needs in education, can – and should – be used in education to reach each student's potential and, therefore, enable a maximum degree of inclusion. Technologies also play an essential role in communication. However, the benefits of technology are not limited. Still, they can also be used as a tool for social inclusion and the development of relationships at school since social comfort is one of the critical aspects of school success.

Keywords: information and communication technologies, special educational needs, inclusive education, digital education, students with diverse needs

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Introduction to Digital Education for Diverse Needs

Modern society is often referred to as an information society (Schement, 2018; Webster, 2014). In this context, we can talk about the so-called digital divide, which threatens people without access to modern technologies. The World Health Organization and UNICEF Global Report on assistive technology (2021, 2022, 2024) highlights the urgent need for improving access to assistive products, with an estimated 2.5 billion people requiring at least one assistive product.

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According to the mentioned documents, assistive technology enables and promotes inclusion and participation, especially for persons with disability, ageing populations, and people with non-communicable diseases. The primary purpose of assistive products is to maintain or improve an individual's functioning and independence, thereby promoting their well-being. They enable people to live healthy, productive, independent, and dignified lives, as well as to participate in education, the labour market, and civic life (comp. UNESCO, 2023).

Education is evolving, just as society is evolving. The development of society is thus undeniably reflected in approaches to teaching. In recent years, we have increasingly encountered technology and its use in education, including special or inclusive education.

As recognised in the Incheon Declaration (UNESCO, 2023), the achievement of the fourth Sustainable Development Goal (SDG 4) is dependent on opportunities and challenges posed by technology. Technology appears in six out of the ten targets. Technology affects education through five distinct channels: input means of delivery, skill, tool for planning, and providing a social and cultural context.

For children with special and diverse educational needs, we encounter a wide range of support that aims to compensate for deficits and offer competencies, thus enabling a maximum degree of inclusion in all areas of school life. Technologies have an essential role in this process. They are used both in learning processes and in communication. However, the benefits of technology are not limited to these areas. Still, they can also be used as a tool for social inclusion and the development of relationships at school since social comfort is one of the critical aspects of school success. The premise that ICT improves the quality of life, reduces social exclusion and enhances participation is also recognised internationally. In 2011, the European Agency for Special Needs and Inclusive Education launched the ICT4I project (Information and Communication Technology for Inclusion), which focused on the use of ICT as a means of promoting inclusion in education. Many countries were involved. Among the outcomes were the findings that ICT has the potential to enhance respect for diversity and enable all pupils to have equal opportunities to learn (Watkinson, 2013).

Flair (2023) writes that electronic and digital tools are seen as a means to enhance learning and provide a rewarding experience for all students. Educational program administration is also benefiting from the growth of technology, allowing for more successful tracking and analysis of student progress. It provides for finer tuning of learning objectives and corresponding learn-

ing units. Although many people welcome these benefits, critics say that the overuse of electronic devices in classrooms can disrupt the educational experience for some students because it is too impersonal and lacks a sufficient social component.

Information and Communication Technologies (ICT) and Assistive Technologies (AT)

Information and communication technologies (ICT) and assistive technologies (AT) are partially interlinked. AT is designed for people with disabilities to overcome barriers caused by disability. ICTs are digital technologies that are initially used for information handling (searching, sorting, storing) and, once individual computers are connected, also for communication and information sharing, regardless of the user's health condition.

The use of ICT or assistive technologies is associated with the development of competence not only of students but also of teachers, parents, and counsellors. Interdisciplinary cooperation is thus essential in this area. Teachers can easily share student progress with parents. For example, they can create graphs on a laptop showing a particular student's successes and challenges.

The basic definitions of AT come from US legislation and the WHO. The Technology-Related Assistance Act (1988) and the Assistive Technology Act (1998) provide a standard definition of assistive technology as 'any item, piece of equipment, or product, whether acquired commercially, modified, or customised, that is used to increase, maintain, or improve the functional capabilities of individuals with disabilities.' Similarly, WHO (Cook & Polgar, 2014) defines AT as any product, tool, device or technology adapted or specifically designed to improve the functioning of a person with a disability. The ISO 9999 classification of technical aids (2011, revised by 2022), together with the ICF (World Health Organization, 2007; Edyburn, 2004), defines AT as 'any product, apparatus, device or technical system used by a person with a disability, specially made or commonly available, that prevents, compensates for, monitors, mitigates or neutralises a disability or improve the functional capabilities of a child with a disability'. It is recognised that an assistive device can be any product or technology, including systems and services (World Health Organization, 2024). Assistive technology enhances independence and well-being, is a human right, and should be accessible to all (World Health Organization, 2022).

There are many studies describing AT. Functioning in everyday life and developing reading and functional literacy by providing access to printed materials and books in a variety of accessible formats, speech-to-text technologies, talking watches, support systems for the deaf or hard of hearing,

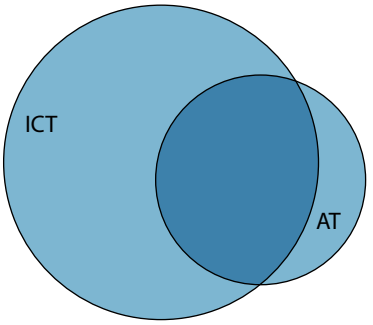

Figure 1 The Use of ICT and Digital Assistive Technologies in Education

Braille or other information accessibility for children with visual impairments describes Hunt (2021). Promoting productivity and school achievement and motivation to continue working discuss Parette & Peterson-Karlan (2007) or Svensson et al. (2019).

In the Czech Republic, computers began to appear in schools gradually and slowly in the 1980s. The first systemic integration of computers into education came in 2001 under the name 'Internet for Schools'.

Digital Education in Inclusion

The application of ICT in inclusive education widens the role of special education teachers. Červenka et al. (2023) define special education teachers as mediators with many roles.

The technology used in schools to educate students with diverse needs brings certain benefits; for example, it reduces the risk of social exclusion. Assistive, information, and communication technologies can facilitate or enable these students to access specific sources of information that would otherwise be difficult or unavailable to them. Digital technologies also allow or facilitate communication. The use of a combination of hardware + software + the Internet can provide students with diverse needs (physical, communicative, perception, psychical, etc.) with a connection with the outside world that would otherwise be limited or downright impossible.

Students with disabilities have difficulty participating in the classroom because of limitations (disabilities) that result from the nature of their disability (physical limitations, visual or hearing impairments, intellectual disabilities or cognitive impairments, impaired communication skills, autism spectrum disorders, etc.). These limitations can be alleviated (even if only partially) by the use of the necessary compensatory aids, the appropriate use of modern

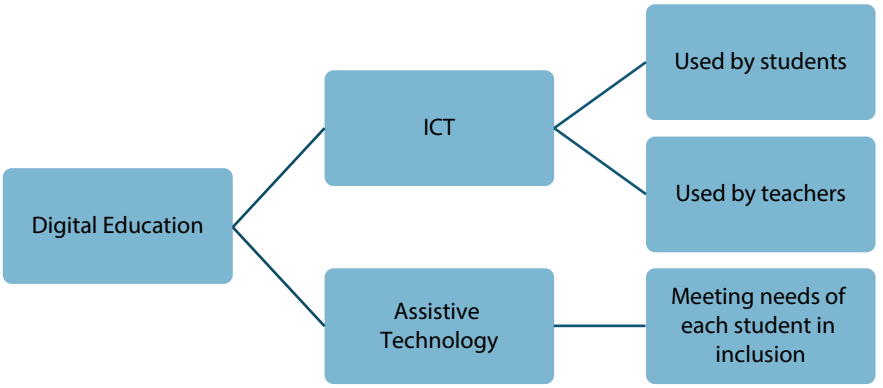

Figure 2 Connection Between ICT and AT used in Inclusive Education Leading to Meeting Diverse Needs

technology and the inclusion of didactic aids in teaching or re-education. A well-thought-out combination of assistive, information, communication and digital technologies can then reduce the risk of social exclusion, enable or facilitate the education of pupils with special educational needs and support people in their independence and dependence on the help of others (Pitnerová, 2013, 2016; Cizlerová, 2020).

The use of information and communication technologies in the educational process helps to reduce digital divides in favour of equality of educational opportunities. It is one of the means of supporting the individual learning needs of all pupils in inclusive education. For this reason, it is a powerful tool to promote differentiation and individualisation of the educational process in a heterogeneous classroom and to support the success of each student.

Currently, the education of pupils with special educational needs is provided through support measures such as (Education Act, 2004, and Ministerial Decree, 2016, as amended, Catalogues of Support Measures):

- special methods and forms of work (special education subjects),
- teaching assistants, sign language interpreters, and a second teacher in the classroom,
- special teaching material (audiobooks, AAC aids, aids for information acquisition and retention and aids for the development of manual skills),
- compensation aids (classroom equipment and to facilitate self-care),
- counselling services providing support and assessment,
- cooperation with families of students,
- reduced number of students in the class.

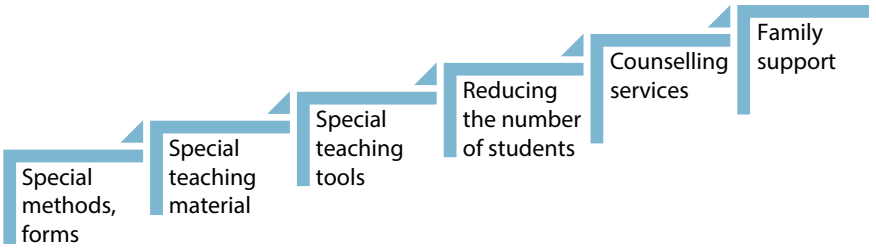

Figure 3 Support Measures of Students with Diverse Needs

Models and 3D Aids (printing)

In recent years, there has been increasing usage of 3D printing. It is a field with great potential for the future. 3D printing is often used in classrooms to support the complexity of approaches, for example, to facilitate reading and writing practice and to strengthen visualisation. This process makes it possible to more intensively connect the acquired knowledge and information with the use of sensory processing and thus increase the effectiveness of learning. 3D printing brought development in the availability of aids for people with disabilities.

The use of models and 3D aids as one of the support measures is appropriate for pupils with special educational needs, such as support for cognitive functions (necessary in the education of pupils with disorders of intellectual development and visual impairments or combined disabilities or support for spoken language comprehension (for pupils with a hearing impairment, a different first language, developmental dysphasia, phonation disorder or any of the autistic spectrum disorders), supporting motivation and sustaining attention (for pupils with learning, attention and behavioural difficulties, and those mentioned above).

Printing on 3D printers is used in the everyday life of children/people with disabilities. Various models of compensatory aids and other 'lifehacks' can be found on the web. While 76 % of the creators surveyed from the open-source community Thingiverse have no health disadvantage (and less than 1 % have undergone training or a course in creating compensatory aids), the motivation of some of them was to make everyday life easier for a family member or close friend. The use of modelling one's designs on a 3D printer has proven to be effective because the models can not only be cheaper and more accessible to the target group but also tailored to the needs of people with disabilities. These 'useful' products, created as 'do-it-yourself assistive technology', are labelled as *Accidentaly assistive technologies* and include, for example, holders such as tactile game dice, prostheses and the like (Buehler et al., 2015).

In the Czech Republic, we encounter 3D printers in schools, although not everywhere. Lepka (in Dosedla et al., 2023) found out in his research that 69 % out of 234 respondents (primarily primary school teachers) had already had some experience with 3D printing. In the Czech Republic, there are companies (Y Soft and Prusa Research) that support various projects to develop the use of 3D printing in primary and secondary schools. As part of its activities, it offers 3D printers to schools for borrowing and websites with finished models or teaching lessons. Some of the lessons, designed by experts from Masaryk University, Czech Republic and Y Soft (e.g. lessons Under the Microscope), support differentiation in heterogeneous classrooms and lead to individualisation of teaching, thus offering different levels of difficulty to students. They can choose the difficulty of the project they will create according to their interests and abilities (Masaryk University, n.d.).

Examples of Technology Use in Communication Development

Students with developmental speech or language disorders often require support for their communication skills in the educational process. They frequently benefit from programmes designed to support students with developmental learning disorders, given that these difficulties are often comorbid with language disorders or have their origins in them. The consequences of language disorders, particularly those affecting speech comprehension due to inadequate speech signal processing, can result in a range of misunderstandings and occasionally unintended outcomes within the educational context. Furthermore, educators' insufficient understanding of language difficulties that arise during the learning process, lack of effective motivational strategies, and inappropriate use of ICT in the classroom can impede progress and hinder the potential for an optimal and successful inclusive teaching and learning process. Furthermore, educators' inadequate understanding of language difficulties that emerge during learning, lack of effective motivation strategies, and insufficient use of ICT in the classroom can have a detrimental impact on the learning process, as these factors have been identified as essential for an optimal and successful inclusive teaching and learning process. It can be reasonably argued that the effective utilisation of ICT or digital technologies during classes can be highly beneficial (Hunt, 2021; Cincotti et al., 2008; Buchholz et al., 2020).

We gathered the most utilised digital devices in the Czech inclusive education. The findings are based on a quantitative survey of 115 respondents, namely teachers of the first grade of elementary school. Despite the gradual improvement in awareness and use of digital technologies, interactive whiteboards re-

main the most frequently used in the Czech environment. The data indicates that the most commonly used device is the interactive whiteboard, with 55 % of respondents indicating its use. Mobile phones are used by 18 % of respondents, tablets by 15 % of respondents, notebooks/PCs by 6 % of respondents, and iPads by 6 % of respondents. These results underscore the preeminence of interactive whiteboards in the Czech educational environment (Straková, 2021). This finding is substantiated by the research of Beránková (2024). Kindermann (2017) in his study adds additional information that reflects positive feedback from the use of digital technology in the form of an interactive whiteboard in the classroom from the perspective of the students themselves.

The information presented in the following section is based on the current state of educational practice and reflects the needs of the field. In order to succeed at an inclusive school for students with a developmental language disorder, they require comprehension support and simplification of instructions (verbal or written). Such an approach is often essential and plays a crucial role in effective inclusive education. The current market offers a variety of computer programs or applications intended for creating alternative and augmentative communication (AAC). These programs and applications are particularly beneficial in inclusive educational environments, such as those found in Czech schools. They facilitate communication and enhance comprehension.

The figure illustrates a selection of representative programs and applications, including Symwriter, InPrint with Widgit Software, and Boardmaker with Picture Communication Symbols. Moreover, there are a number of widely used applications, including Go Talk Now, MetaTalk, Grid for iPad, Grid Player, and the Czech school-specific applications 'Včelka' (The Bee) and Altík. However, as illustrated by the findings of Straková (2021), the most frequently utilised application in the Czech inclusive educational environment for supporting communication, interaction, reading, and writing literacy is the 'Včelka' application, which is used significantly more frequently than other applications. By the end of 2021, over 500 primary schools in the Czech Republic had adopted this digital tool to assist more than 400,000 students (Jiřičková, 2021). In contrast, applications such as Grid for iPad, MetaTalk, and Go Talk Now can be employed more effectively as a means of communication for the daily individual needs of a particular student, not only within the educational context (Castaneda et al., 2023).

In order to facilitate communication and comprehension, it may be beneficial to utilise software or applications that assist in modifying or reordering words within sentences, a process known as AAC. This approach can significantly contribute to the development of coherent syntax. Such software

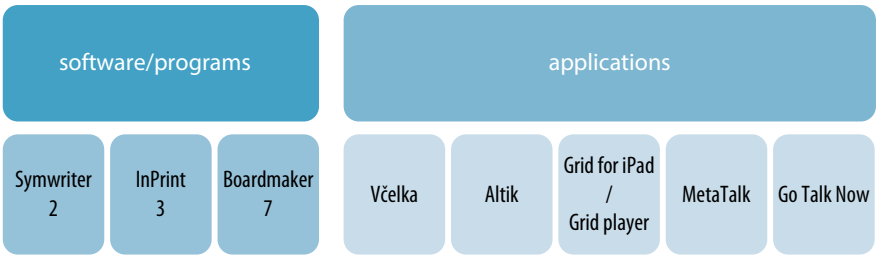

Figure 4 Software and Apps Used in the Czech Inclusive Environment

could also prove beneficial in facilitating comprehension of verbal instructions. It allows the creation of an individual core vocabulary, the highlighting of essential keywords, and the construction of communication logs or books, among other possibilities. It is of great importance to promote good comprehension and to facilitate the creation of syntax throughout the entire educational process in an inclusive school environment.

Furthermore, the utilisation of these software applications offers the additional benefit of facilitating the expression of a diverse range of emotions and feelings. The already mentioned software programs have been designed with a variety of specialised subcategories, which can be used to express a multitude of emotions and feelings and present a significant advantage during the educational process, as they enable the prevention of overload and the avoidance of psychosomatic problems or their deepening. For students who experience considerable difficulties in acquiring their native language and in expressing themselves, this support for communication can be invaluable. Šarounová (2022) maintains that the core vocabulary should comprise approximately 200–300 words and should be augmented with a thematic vocabulary that relates specifically to specific domains. Dodd (2017) argues that the selection of vocabulary for communication and its organisation should be undertaken with careful consideration. A similar approach should be applied to the choice of appropriate software. In general, the use of applications to support teaching in the Czech inclusive environment is currently reasonably sufficient, as evidenced by the survey results by Straková (2021) and Kindermann (2017).

Conversely, the utilisation of digital tools to facilitate the acquisition of language competencies and reading and writing proficiency is not yet pervasive across all educational institutions. Nevertheless, the outcomes depicted below appear to be notable. Potential explanations for the underutilisation of such technologies can be attributed to a lack of awareness and information regarding the availability of these resources for children with special needs.

The necessity of appropriate support for understanding instructions and assigning activities or tasks to students with developmental language disorders during classes is currently a topic of high debate within the Czech counselling and educational system. The necessity for support of students with developmental language disorder is currently most evident in counselling practice in an inclusive environment, reflecting the actual and real needs of this group of students. As evidenced by practice, the utilisation of programs that facilitate communication modelling is essential for language acquisition and also provides a practical approach to supporting comprehension in the educational process (Castaneda et al., 2023). The programs, as mentioned earlier, enable the creation of individual communication books, core vocabulary lists, and new terminology, and they can assist in orientation regarding assignments through the provision of a dictionary of complicated terms. They facilitate the successful comprehension of meaning and content, which is beneficial in an educational context.

Insufficient processing of the speech signal and a weak phonological loop (insufficient auditory verbal memory) result in significant difficulties during the teaching process, particularly regarding understanding or recalling instructions. The Czech educational system frequently places substantial demands on auditory processing, which can cause problems for students with language development deficits. Providing printed or digital instruction or learning texts with underlined or highlighted keywords can facilitate access to information for these students. ICT-based learning tools and software applications for teacher education, such as 'Včelka' and SymWriter, can be used to enhance learning. Alternatively, a regular computer and text editor can be employed.

What, then, are the principal criteria for the selection of one of the listed software and applications? The choice of an appropriate software program in a Czech inclusive environment is based on several fundamental considerations. Primarily, the software should reflect the individual requirements of the student. Secondly, the program should be designed to suit the specific requirements of the environment, allowing for the broadest possible use. In conclusion, as Koudelková (2023) indicates in her research, the decision should be a collective one, with input from all relevant parties. The decision to select an appropriate programme or software for the required system – the AAC system – requires a comprehensive assessment of the individual's current abilities, strengths and needs. It is of the most significant importance to avoid imposing any limitations on its potential (American Speech-Language-Hearing Association, n.d.). In their study, the authors Foster Skalová et

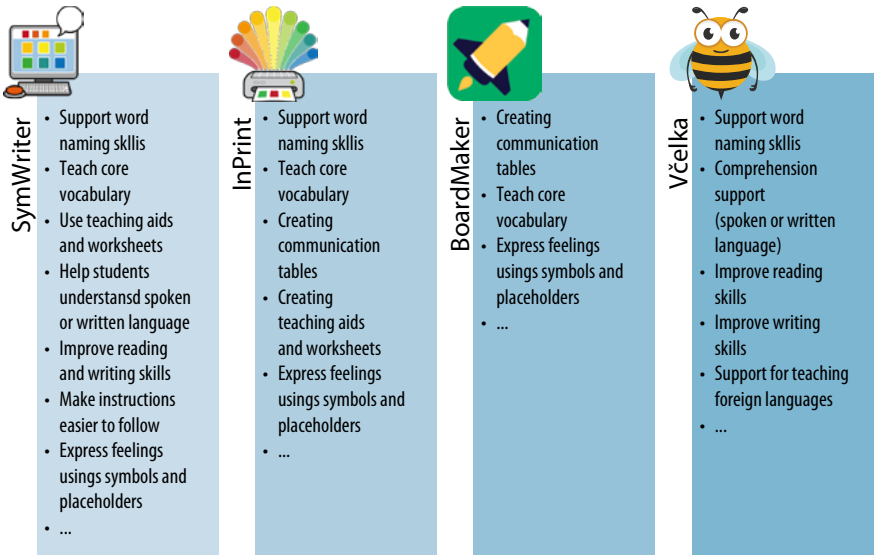

Figure 5 Purposes of Utilising Concrete Software and Applications in Inclusive Czech Environments

al. (2021) identify the principle of everyday communication modelling as the most significant approach to supporting communication while also identifying it as the most challenging. Observation is always beneficial. In an educational setting, modelling is demonstrated through the act of accompanying spoken keywords with the relevant symbol or supplementing them with a sign (Šarounová, 2022).

The following section outlines the specific purpose of utilising the mentioned software, derived from the experience and educational practice of special pedagogues and those working in inclusive schools. SymWriter is a valuable tool for individuals who have difficulty with written text, whether in the act of reading or writing. The software is beneficial for educators and learners alike, offering a feature that automatically inserts symbols above the typed word as it is entered. For educators, the software is a helpful tool for the creation of diverse instructional materials, including visual aids, didactic games for reading literacy development, step-by-step instructions or definitions, songs, stories, and style exercises with the support of symbols. In comparison with InPrint, it is more suitable for the composition of longer texts and is equipped with voice output functionality. The most used software for the creation and printing of communication boards is Boardmaker, which also permits the editing of symbols and the insertion of user-generated images (Petit HW-SW, n.d.; Pachner, n.d.). InPrint 3 is an alternative to

Boardmaker that offers the advantage of being fully translated into Czech. The software provides a range of options for the creation of diverse visual aids, games, tasks and modes of the day, as well as daily routines. The Grid 3 software is more frequently preferred for individualised use, as it allows the user to communicate using voice output and to control a computer or a smart home. The software offers users the ability to customise various aspects of its functionality, including text, colours, display size, and overall control. There are a variety of input methods, such as a switch, mouse, touch, pointer, or glance (Petit HW-SW, n.d.). In consideration of the American Speech-Language-Hearing Association (n.d.) findings indicating that the AAK systems currently in use may not be optimal in the future, it can be posited that the most prevalent software, applications, or programs at present may not retain their dominance soon.

Examples of Technology Use for Specific Sensory Needs

Special software and hardware make the text accessible. There is the possibility of enlarging details, enlarging and choosing a font, modifying colours or colour contrast, or tactile or voice output. There are screen readers and speech synthesisers, as well as braille tactile lines. The voice output enables auditory feedback, and the tactile line is suitable for displaying the grammatical side of the text.

The development of assistive devices for deaf and hard-of-hearing individuals has brought about both new tools and improvements to existing ones, whether they are corrective aids, compensatory aids, or educational-didactic aids. Technological advancements have also facilitated the creation of programs and applications that simplify communication for people with hearing impairments. Nowadays, it is possible to use video calls on phones for real-time communication. Over time, technologies like fax machines and teletypewriters have been replaced by more modern and faster methods of communication – thanks to computers, smartphones, and the Internet (Pitnerová, 2013; Pecháčková, 2017). The development of digital technologies has thus enhanced and expanded the possibilities for both intra-cultural and intercultural communication for individuals with hearing impairments.

Students with hearing impairments use hearing aids, such as radio transmissions of sound: FM systems or cochlear implants. Other devices serve for induction listening of sound (induction loops and wired and wireless amplifiers. Signalising devices can also help during school time (alarm clocks, timers, tools detecting and signalising sound). Software applications cover automatic computer speech recognition (technology that allows a computer to

respond to information communicated by voice and convert it into text) and programs that help with speech development by visual feedback on how the user uses loud speech pronunciation. These special programs are Mentio or Brepta and are an integral part of speech therapy for children with congenital or early-acquired hearing impairments. There are also internet applications (videos on YouTube, WEBlik internet broadcasting for people who are deaf or hard of hearing) (Pitnerová, 2013).

The most used aids among the 24 deaf individuals surveyed in Gruberová's research (2021) were light and vibration signalling devices (34 %) (such as alarm signals, mobile phone notifications, or smartwatch vibrations). Right after signalling devices, mobile phones and mobile applications were the second most used (28 %). Cochlear implants were used by 13 % of respondents, hearing aids by 11 %, induction loops by 6 %, Teletext and TV subtitles by 4 %, and an assistance signal dog by 2 %. The most frequently used means of communication with hearing individuals were chat applications like Messenger and WhatsApp, which were used by 42 % of respondents. Facebook, Skype, and SMS messages were mentioned by 27% of respondents, the DEAFCOM application by 13 %, and the Tichá linka app from Tichý svět or Live Transcribe, as well as email by 5 % of respondents.

We will now introduce the basic AT used by people with severe *visual impairments*. Digital technologies improve and facilitate the lives of people with severe visual impairments when they do not have access to texts in digital form (Bernard, 2019). Paseka (2015) highlights information and communication technologies designed specifically for blind and visually impaired individuals, including specialised auxiliary devices for computing technology and tailored software. Additionally, it covers mobility assistance devices, which are various tools that help with orientation and movement. The document also mentions optical aids, such as special glasses and other optical tools that enhance. Finally, it discusses leisure and sports aids. Paseka's research (2015) showed frequently used tools by informants with visual impairments – Digital Reading Devices (a device with voice or tactile output), Digital magnifying glass/electronic magnifiers (often in the form of a personal computer or laptop), Braille E-reader, Braille printer, Screen Reader, Voice synthesiser (a device converting text to speech) and Electronic Communication Aids (a mobile phone or tablet with a screen reader and voice output).

Examples of Technology Use for Specific Physical Needs

People with physical disabilities often require lifetime support and experience challenges to maintain or (re)define their level of independence. Having

a physical disability no longer means that things cannot be done. Thanks to technology, we can find new ways to accomplish our goals. Assistive technology can be used in two ways: to help do things that people without disabilities can do without technology and to improve access to everyday technology that is not designed for people with disabilities. In both cases, the focus is on matching individuals with the tools best suited to fill their needs (Anston, 2018). Some devices can be easily purchased and make a significant difference in everyday living or be a great starting point when reducing barriers (Awde et al., 2022). Computers, laptops, and mobile devices are a must today. Students can use symbols, written forms of spoken speech, or portable communicators with voice output and single or multiple messages. Other multifunctional assistants are computers with special programs and drivers, enabling cooperation with individually adapted buttons, sensors, keyboards, trackballs, joysticks, alternative mice and other control tools. Modified control devices facilitate access (instead of keyboard and mouse) and ensure more accurate and legible typing.

Cranmer (2021) investigates learning with digital technologies within the context of inclusive education. Assistive living technologies (ALT) are promising to increase independent living and execution of activities of daily living (ADL). Nine studies were included, of which seven qualitative, one quantitative, and one mixed method. Quality was generally high. ALT enabled participants to execute ADL. We found six themes for the impact of ALT on perceived independence: feeling enabled, choice and control, feeling secure, time alone, feeling less needy, and participation (Van Dam et al., 2024).

The research, as mentioned earlier, is supported by an investigation published by Moen & Østensjø (2024), who included in their study the 130 children with cerebral palsy and their families used a median of 2.5 assistive devices (range 0–12) to support positioning, mobility, self-care and training, stimulation and play. Devices had one or two primary purposes and were used both at home and in kindergarten/school. The usage rate varied from less than twice a week to several times a day. Most parents reported significant benefits for caregiving and/or the child's functioning. Total use increased in accordance with the level of the child's gross motor limitations and was associated with restrictions imposed by housing concerns. The findings show that the frequent use of a wide range of devices had many benefits. It demonstrates that early provision of assistive devices can be an effective function-enhancing strategy in young children with cerebral palsy. However, the findings also indicate that factors other than the child's motor abilities

must be considered when integrating the use of devices into the child's daily routines and activities.

Support of mobility and motor skills and improvement of communication, using of residual motor skills for self-sufficiency – e.g. household management describes Cincotti et al. (2008). Increasing self-concept, independence and task performance are discussed in Chiang & Jacobs (2009).

Another area of use of assistive ethnology is in the field of education. The research conducted among 250 teachers showed that assistive technologies are used daily by more than 50 % of teachers, while for teachers working with pupils with special needs, this percentage is 70 %. On the other hand, the research also pointed out that it is not always necessary to use specially adapted software. Still, almost 50 % of pupils with special needs also use regular educational applications. The research also showed that educators use the full range of available applications (Cizlarová, 2020), and Cranmer (2021) came up with a similar result in his analysis of the research, where it is confirmed that individuals (pupils) with special needs are more likely to use technology themselves.

Further research by Dzivá (2023) suggests that in the education and development of pupils with disabilities, all areas of development need to be in balance and the approach needs to match this. Thus, we cannot just focus on technology in support but also on a holistic approach. In recent years, we have also increasingly seen the possibility of using AT, a topic that Pancholi et al. (2024) addressed in their investigation: assistive technologies (AT) enable people with disabilities to perform activities of daily living more independently, have greater access to community and healthcare services, and be more productive performing educational and/or employment tasks. Integrating artificial intelligence (AI) with various agents, including electronics, robotics, and software, has revolutionised AT, resulting in groundbreaking technologies such as mind-controlled exoskeletons, bionic limbs, intelligent wheelchairs, and smart home assistants.

As can be seen from the above, technology is making life much more accessible for people with disabilities and is affecting areas of everyday life and education. The further development and application of technology to this target group will continue to happen, and feedback from disabled people themselves reflecting their needs will also be necessary.

Examples of Technology Use for Developmental Learning Disorders and ADHD

Dictaphones, scanners, and copiers can be used to record or present indicators and buzzers during re-education, calculators to speed up numerical operations, and educational software to explain new material and verify already acquired knowledge. There is software for making printed text accessible in alternative formats – audio format, SAT format (synchronised audio and text = the application reads the source text with a synthetic voice and at the same time highlights the read text on the screen so that the disadvantaged reader can connect the spoken and written form of the word). Multimedia CD-ROMs with their sounds, graphics and animations can attract the pupil's attention, and interactive whiteboards allow the teacher to use materials and activities to diversify the teaching. The use of educational programs helps to remove some barriers, such as dislike of writing and supports creative work. Using tutorial software has the advantage that the program is consistent. As part of the intervention for people with ADHD, we increasingly encounter the EEG Biofeedback method. This method is used to strengthen the desired activation of the nervous system, primarily for training attention and concentration, as well as self-control. It assumes that the brain learns to use its abilities and capacity better, more efficiently, and with less energy expenditure through play. Biological feedback monitors brain activities based on cortical action potentials. Based on the use of a particular computer program enables the regulation of the frequencies of the electrical activity of brain waves. The program converts the sensed brain activity (EEG) into individual elements of the computer game and then issues feedback information about the effectiveness of the training. Training materials for memory, reading, writing, organisation practice, mathematical problem solving can be found in Lee & Templeton (2008). Text-to-speech or speech-to-text applications to simplify reading and writing are offered by many authors, such as Svensson et al. (2019), Balharová et al. (2021), Bäck et al. (2023) or Nordström et al. (2018).

Conclusion and Challenge for the Future

Multidisciplinary teams working with people with diverse needs are trying to promote independence through assistive technologies. It is always necessary to have sufficient information about the person and his needs before choosing assistive technologies and aids. The use of AT should be implemented and controlled by a specialist working with the student. The expert also works on developing strategies to overcome the barriers that reading and writing disabilities bring (Paseka, 2015; Bäck et al., 2023).

Bennett et al. (2018) suggest reducing the dependence of people with disabilities on the support of others by using assistive technologies. The authors define interdependence that can extend a diversity of ways to avoid dependence.

Some people see AT as an obstacle that slows them down – it distinguishes them from the majority and automatically puts them in the group of 'disadvantaged'. They cannot cope with it and have trouble integrating AT into their lives (Bennett et al., 2018; cf. Desmond et al., 2018). On the other hand, some people accept their aid as help, and thanks to it, they can move forward. They expand the possibilities of interaction between all members of society and can also help to support and protect the complete maintenance of fundamental human rights and freedoms (Desmond et al., 2018).

We described different aspects of using information and communication technologies to promote effective teaching and learning for students with diverse needs in inclusive schools in eight subchapters. Each focused on a specific disorder. The review of current research in the described area followed the theoretical concepts. We described hardware, software and other special aids which are used in Czech inclusive schools. Our goal was to show that a wide range of digital tools is suitable for students with special educational needs and, thus, diverse needs that can be incorporated into education. These aids help to reach each student's potential. They, therefore, enable a maximum degree of inclusion. Technologies play an essential role in communication, and they can be used as a tool for social inclusion and the development of relationships at school since social comfort is one of the critical aspects of school success, as we stated in the Abstract.

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Učinkovito poučevanje in učenje v digitalnem izobraževanju za češke učence z različnimi potrebami

Avtorji v prispevku obravnavajo različne vidike uporabe informacijsko-komunikacijskih tehnologij za spodbujanje učinkovitega poučevanja in učenja učencev z raznolikimi potrebami v inkluzivnih šolah. Pregled obstoječih raziskav na posameznih obravnavanih področjih sledi teoretičnim konceptom ter vključuje opis strojne in programske opreme ter drugih specializiranih pripomočkov, ki jih je mogoče uporabljati v šolskem okolju. Širok nabor digitalnih orodij, ki so primerna za učence s posebnimi potrebami in posledično naslavljajo raznolike izobraževalne potrebe vseh učencev, se lahko – in bi se moral – uporablja(ti) v splošnem izobraževanju, da bi vsakemu učencu omogočili uresničitev njegovega potenciala, in s tem najvišjo stopnjo vključenosti. Tehnologije imajo

ključno vlogo tudi pri komunikaciji. Njihove koristi pa niso omejene zgolj na učne procese, temveč lahko služijo tudi kot orodje za spodbujanje socialne vključenosti in razvoj medosebnih odnosov v šolskem okolju, saj je socialna varnost eden izmed ključnih dejavnikov šolskega uspeha.

Ključne besede: informacijsko-komunikacijske tehnologije, posebne izobraževalne potrebe, inkluzivno izobraževanje, digitalno izobraževanje, učenci z raznolikimi potrebami